THAT WHICH IS CLAIMED:

1. A polymer composition, comprising a mixture of a polymer derivative having the structure R-O-POLY-R' and a polymer derivative having the structure R-O-POLY-O-R, wherein POLY is a water-soluble and non-peptidic polymer, R is an alkyl or an aryl group, and R' is a functional group.

2. The polymer composition of Claim 1, wherein POLY is selected from poly(alkylene oxides), poly(acryloylmorpholine), poly(oxazoline), and poly(vinylpyrrolidine).

3. The polymer composition of Claim 1, wherein POLY is poly(ethylene glycol).

4. The polymer composition of Claim 3, wherein POLY has the formula $-CH_2CH_2-O-(CH_2CH_2O)_n-CH_2CH_2-$, where n is from about 8 to about 4000.

5. The polymer composition of Claim 1, wherein R is methyl.

6. The polymer composition of Claim 1, wherein R' is selected from the group consisting of hydroxyl, mesylate, tosylate, tresylate, $-O-CO_2R_3$ wherein R_3 is H, alkyl or N-succinimidyl, $-O-(CH_2)_n-CO_2R_3$ wherein n is 1-6 and R_3 is H, alkyl or N-succinimidyl, $-NHR_4$ wherein R_4 is H or alkyl or an amine protecting group, $-O-(CH_2)_n-CH(ZR_5)_2$ wherein n is 1-6, and Z is O or S, R_5 is H or an alkyl group, $Ar-CH=CH-CH=CH-CO_2-$, wherein Ar represents a moiety selected from the group consisting of phenyl, substituted phenyl, biphenyl, substituted biphenyl, polycyclic aryls, substituted polycyclic aryls, and heterocyclic aryls, $-O-(CH_2)_n-CHO$ wherein n is 1-6, $-O_2CCH_2CH_2CO_2R_6$, wherein R_6 is H or N-succinimidyl, $CH_2=CH-CO_2-$, and $-O-CH_2-CO_2CH(CH_3)CH_2CO_2-NHS$, wherein NHS is N-succinimidyl.

7. The polymer composition of Claim 1, wherein R' is hydroxyl.

8. The polymer composition of Claim 1, wherein R' is $-O-CO_2R_3$ or $-O-(CH_2)_n-CO_2R_3$, wherein n is 1-6 and R_3 is H, alkyl or N-succinimidyl.

9. The polymer composition of Claim 8, wherein R_3 is N-succinimidyl.

10. The polymer composition of Claim 1, wherein R' is $-O-(CH_2)_n$–CHO wherein n is 1-6.

11. The polymer composition of Claim 1, wherein R' is $-O-(CH_2)_n-CH(ZR_5)_2$ wherein n is 1-6, Z is O or S, and R_5 is H or an alkyl group.

12. The polymer composition of Claim 1, wherein POLY is poly(ethylene glycol), R is methyl, and R' is $-O-(CH_2)_n$–CHO wherein n is 2.

13. The polymer composition of Claim 12, wherein POLY has the formula $-CH_2CH_2-O-(CH_2CH_2O)_n-CH_2CH_2-$, where n is from about 8 to about 4000.

14. The polymer composition of Claim 1, wherein POLY is poly(ethylene glycol), R is methyl, and R' is hydroxyl.

15. The polymer composition of Claim 14, wherein POLY has the formula $-CH_2CH_2-O-(CH_2CH_2O)_n-CH_2CH_2-$, where n is from about 8 to about 4000.

16. A polymer composition, comprising a polymer derivative having the structure R-O-POLY-R', wherein POLY is a water-soluble and non-peptidic polymer, R is an alkyl or an aryl group, and R' is a functional group, in the absence of HO-POLY-OH.

17. The polymer composition of Claim 16, wherein POLY is selected from poly(alkylene oxides), poly(acryloylmorpholine), poly(oxazoline), and poly(vinylpyrrolidine).

18. The polymer composition of Claim 16, wherein POLY is poly(ethylene glycol).

19. The polymer composition of Claim 18, wherein POLY has the formula $-CH_2CH_2-O-(CH_2CH_2O)_n-CH_2CH_2-$, where n is from about 8 to about 4000.

20. The polymer composition of Claim 16, wherein R is methyl.

21. The polymer composition of Claim 16, wherein R' is selected from the group consisting of hydroxyl, mesylate, tosylate, tresylate, $-O-CO_2R_3$ wherein R_3 is H, alkyl or N-succinimidyl, $-O-(CH_2)_n-CO_2R_3$ wherein n is 1-6 and R_3 is H, alkyl or N-succinimidyl, $-NHR_4$ wherein R_4 is H or alkyl or an amine protecting group, $-O-(CH_2)_n-CH(ZR_5)_2$ wherein n is 1-6, and Z is O or S, R_5 is H or an alkyl group, $Ar-CH=CH-CH=CH-CO_2-$, wherein Ar represents a moiety selected from the group consisting of phenyl, substituted phenyl, biphenyl, substituted biphenyl, polycyclic aryls, substituted polycyclic aryls, and heterocyclic aryls, $-O-(CH_2)_n-CHO$ wherein n is 1-6, $-O_2CCH_2CH_2CO_2R_6$, wherein R_6 is H or N-succinimidyl, $CH_2=CH-CO_2-$, and $-O-CH_2-CO_2CH(CH_3)CH_2CO_2-NHS$, wherein NHS is N-succinimidyl.

22. The polymer composition of Claim 16, wherein R' is hydroxyl.

23. The polymer composition of Claim 16, wherein R' is $-O-CO_2R_3$ or $-O-(CH_2)_n-CO_2R_3$, wherein n is 1-6 and R_3 is H, alkyl or N-succinimidyl.

24. The polymer composition of Claim 23, wherein R_3 is N-succinimidyl.

25. The polymer composition of Claim 16, wherein R' is $-O-(CH_2)_n-CHO$ wherein n is 1-6.

26. The polymer composition of Claim 16, wherein R' is $-O-(CH_2)_n-CH(ZR_5)_2$ wherein n is a number of 1-6, Z is O or S, and R_5 is H or an alkyl group.

27. The polymer composition of Claim 16, wherein POLY is poly(ethylene glycol), R is methyl, and R' is -O-$(CH_2)_n$–CHO, wherein n is 2.

28. The polymer composition of Claim 27, wherein POLY has the formula -CH_2CH_2-O-$(CH_2CH_2O)_n$-CH_2CH_2-, where n is from about 8 to about 4000.

29. The polymer composition of Claim 16, wherein POLY is poly(ethylene glycol), R is methyl, and R' is hydroxyl.

30. The polymer composition of Claim 29, wherein POLY has the formula -CH_2CH_2-O-$(CH_2CH_2O)_n$-CH_2CH_2-, where n is from about 8 to about 4000.

31. A polymer conjugate composition, comprising a mixture of a conjugated polymer having the structure R-O-POLY-M_1, wherein POLY is a water-soluble and non-peptidic polymer, R is an alkyl or an aryl group, and M_1 is a macromolecule, with a polymer derivative having the structure R-O-POLY-O-R, wherein R and POLY are as defined above.

32. The polymer conjugate composition of Claim 31, wherein M_1 is selected from the group consisting of proteins, peptides, lipids, drugs, and polysaccharides.

33. The polymer conjugate composition of Claim 31, wherein POLY is selected from poly(alkylene oxides), poly(acryloylmorpholine), poly(oxazoline), and poly(vinylpyrrolidine).

34. The polymer conjugate composition of Claim 31, wherein POLY is poly(ethylene glycol).

35. The polymer conjugate composition of Claim 34, wherein POLY has the formula -CH_2CH_2-O-$(CH_2CH_2O)_n$-CH_2CH_2-, where n is from about 8 to about 4000.

36. The polymer conjugate composition of Claim 31, wherein R is methyl.

37. A method of forming a polymer conjugate composition, comprising:

providing a mixture of a polymer derivative having the structure R-O-POLY-R', wherein POLY is a water-soluble and non-peptidic polymer, R is an alkyl or an aryl group, and R' is a functional group, with a polymer derivative having the structure R-O-POLY-O-R, wherein R and POLY are as defined above; and

reacting the functional group R' with a macromolecule to form a mixture of a conjugated polymer having the formula R-O-POLY-M_1, wherein POLY and R are as defined above and M_1 is a macromolecule, and a polymer derivative having the structure R-O-POLY-O-R.

38. The method of Claim 37, wherein POLY is selected from poly(alkylene oxides), poly(acryloylmorpholine), poly(oxazoline), and poly(vinylpyrrolidine).

39. The method of Claim 37, wherein POLY is poly(ethylene glycol).

40. The method of Claim 39, wherein POLY has the formula $-CH_2CH_2-O-(CH_2CH_2O)_n-CH_2CH_2-$, where n is from about 8 to about 4000.

41. The method of Claim 37, wherein R is methyl.

42. The method of Claim 37, wherein R' is selected from the group consisting of hydroxyl, mesylate, tosylate, tresylate, $-O-CO_2R_3$ wherein R_3 is H, alkyl or N-succinimidyl, $-O-(CH_2)_n-CO_2R_3$ wherein n is 1-6 and R_3 is H, alkyl or N-succinimidyl, $-NHR_4$ wherein R_4 is H or alkyl or an amine protecting group, $-O-(CH_2)_n-CH(ZR_5)_2$ wherein n is 1-6, and Z is O or S, R_5 is H or an alkyl group, $Ar-CH=CH-CH=CH-CO_2-$, wherein Ar represents a moiety selected from the group consisting of phenyl, substituted phenyl, biphenyl, substituted biphenyl, polycyclic aryls, substituted polycyclic aryls, and heterocyclic aryls, $-O-(CH_2)_n$–CHO wherein n is 1-6, $-O_2CCH_2CH_2CO_2R_6$, wherein R_6 is

H or N-succinimidyl, CH_2=CH-CO_2-, and -O-CH_2-CO_2CH(CH_3)CH_2CO_2-NHS, wherein NHS is N-succinimidyl.

43. The method of Claim 37, wherein R' is hydroxyl.

44. The method of Claim 37, wherein R' is -O-CO_2R_3 or -O-$(CH_2)_n$-CO_2R_3, wherein n is 1-6 and R_3 is H, alkyl or N-succinimidyl.

45. The method of Claim 44, wherein R_3 is N-succinimidyl.

46. The method of Claim 37, wherein R' is -O-$(CH_2)_n$–CHO wherein n is 1-6.

47. The method of Claim 37, wherein R' is -O-$(CH_2)_n$-$CH(ZR_5)_2$ wherein n is a number of 1-6, Z is O or S, and R_5 is H or an alkyl group.

48. The method of Claim 37, wherein POLY is poly(ethylene glycol), R is methyl, and R' is -O-$(CH_2)_n$–CHO wherein n is 2.

49. The method of Claim 48, wherein POLY has the formula -CH_2CH_2-O-$(CH_2CH_2O)_n$-CH_2CH_2-, where n is from about 8 to about 4000.

50. The method of Claim 37, wherein the macromolecule is selected from the group consisting of proteins, peptides, lipids, drugs, and polysaccharides.